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SURVEYOR GENERAL
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1935/36

DOMINION OF CANADA

DEPARTMENT OF THE INTERIOR

Honourable T. A. Crerar, Minister — J. M. Wardle, Deputy Minister

F. H. Peters, Surveyor General and Director, Topographical and Air Survey Bureau

SERIALS DIVISION
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ANNUAL REPORT

OF THE

TOPOGRAPHICAL AND AIR SURVEY BUREAU

FOR THE

FISCAL YEAR ENDED MARCH 31, 1936

OTTAWA
J. O. PATENAUDE, I.S.O.
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
1936

#100.

The Director's Office
SURVEYS & MAPPING BRANCH
MAR 21 1956
Dep't. of Lands & Forests
VICTORIA, B. C.

TOPOGRAPHICAL AND AIR SURVEY BUREAU

REPORT OF THE DIRECTOR AND SURVEYOR GENERAL, F. H. PETERS

General Statement

The report herewith gives a short summary of the work of the Topographical and Air Survey Bureau for the fiscal year, 1935-36. A year ago a record distribution of over 90,000 maps was emphasized, but last year this record was exceeded with a distribution of over 100,000 maps. Experience shows that those who use maps find it a great advantage to have a whole district covered by accurate map sheets of a standard series, all of the same design, and all fitting accurately together, so that as new sheets of the National Topographic Map series are produced orders are received not only for the new map itself, but also for others which border around it.

At the present time there is a great demand for maps of areas where prospecting for gold is being carried on, and as the scene of these activities often shifts rapidly, it is a matter of very considerable difficulty to make the maps available during the early stages of development, which is the time when they are most valuable. A special effort is made to meet this practical requirement by getting out preliminary editions of the maps. These editions show all the water areas and other chief topographical features, information concerning which is most urgently required, and while very little extra expense is involved these preliminary maps make it possible to meet most of the requirements months before the regular editions are available for distribution.

Another large class of map-users includes tourists and sportsmen. Areas of special interest to them include the Evangeline country in Nova Scotia, the Laurentian area north of the Ottawa river in Quebec, and the Rideau Lakes, Muskoka, Algonquin, Quetico, and Rainy Lake areas in Ontario. These districts are all within easy reach of the great centres of population to the south of us, or of any overseas visitors who may come by way of our Atlantic ports. To others who can travel further the maps of National Parks in the prairie and Rocky Mountain districts in the west, are guides to recreational areas of parkland beauty and mountain grandeur not surpassed anywhere.

A moderate amount of field work was done in every province and also in the Northwest Territories. Detailed topographic surveys were made of an important area in New Brunswick and Nova Scotia, including the isthmus of Chignecto, and of another in British Columbia covering that highly developed part of the Fraser River valley between Vancouver and Chilliwack. The photo-topographic survey of Jasper National Park, Alberta, was continued and a control survey of a popular tourist area in the highlands of Ontario was completed. Field information was obtained for contouring approximately the Ste. Agathe and Maniwaki areas in Quebec. These areas are favourite tourist resorts and the maps are in popular demand. Astronomical observations for latitude and longitude were obtained for the purpose of controlling the mapping by air photographs of several map sheet areas in Ontario, Manitoba, Saskatchewan, and the Northwest Territories.

Co-operation was maintained with the Royal Canadian Air Force, and several large areas were photographed from the air and there were besides a

number of smaller operations. The total number of air photographs now filed in the photographic library for reference purposes exceeds 660,000 and increasing use is being made of the facilities for examining these prints by governmental and private organizations requiring the information to be obtained from them.

The holding of the General Election in October 1935 naturally increased the use of electoral maps, and during the year about thirty thousand of these maps were prepared and distributed under the direction of the Chief Electoral Officer.

Observing latitude and longitude with theodolite, chronometer and radio to determine the geographical position of a point within an area to be mapped. Dubawnt lake, Northwest Territories.

Further details of the work of the Bureau follow under the different sections.

Topographical Mapping

Field Work.—During the field season work was carried on in seven provinces of the Dominion, namely, Prince Edward Island, Nova Scotia, New Brunswick, Quebec, Ontario, Alberta, and British Columbia.

In Prince Edward Island, surveys were made for the purpose of producing plans for the use of the Department of Fisheries in connection with the administration of oyster leases. The areas mapped lie around Foxley river, Mustico bay, Covehead bay, Brackley bay, Tracadie bay, and Savage harbour.

In Nova Scotia and New Brunswick, the Amherst sheet No. 21-H/16 of the National Topographic series was topographically mapped by plane-table methods for publication on the scale of one mile to one inch. This sheet covers the important area lying between Northumberland strait and the bay of Fundy. It comprises the area between latitudes 45°45′ and 46° and longitudes 64° and 64°30′.

The work in Quebec consisted of obtaining information for the approximate contouring of the Ste. Agathe sheet No. 31 J/S.E. and the Maniwaki sheet No. 31-J/S.W. of the National Topographic series, which together comprise the area between latitudes 46° and 46° 30′ and longitudes 74° and 76°. The contouring was done on vertical air photographs with the aid of the stereoscope, the contour interval adopted being 100 feet.

In Ontario, the work consisted of interpreting in the field topographic information appearing on vertical air photographs of the Bobcaygeon and Haliburton sheets of the National Topographic series, which together comprise the area between latitudes 44°30′ and 45°30′ and longitudes 78° and 79°. The work was done by the same party that established horizontal control for these sheets, and spirit levels were also taken along the control lines.

A photo-topographic survey was made of that portion of Jasper National Park, Alberta, surrounding Maligne lake and this was extended southeasterly to join up with similar surveys previously made.

The work in British Columbia consisted of continuing the detailed topographic mapping in the Fraser River valley on the Sumas sheet No. 92-G/1 of the National Topographic series. This included instrumental work for both control and topography and complete topographic detail was obtained for the area lying between Fraser river and the United States boundary. This was done by using the plane-table and vertical air photographs, supplemented by ground photo-topographic pictures for the rugged areas. This area covers an important portion of British Columbia and it is intended to publish the information on the scale of one mile to the inch. Interpretation of topographic details, together with revision of existing maps, was also completed for the Victoria two-mile map sheet No. 92 B/N.W. and S.W.

Office Work.—The usual office work in connection with producing new maps, revising maps which have become out of date, and preparing reprints of those maps for which the stocks have become exhausted was carried on. The list of maps in hand appearing in another section of this report indicates the localities throughout the country for which maps are being prepared.

Air Surveys

In the preparation of the various map sheets of the National Topographic series there is no method which has been found as effective as that of air photography. The areas in Canada covered by the majority of the map sheets issued in recent years on the four-mile scale present conditions suitable for the application of oblique air photography. Hence this type of photography has become associated with small scale reconnaissance mapping. Vertical air photography has been used for mapping on larger scales such as 2 miles to 1 inch, or 1 mile to 1 inch, or in areas where the relief calls for consideration and where the stereoscopic value of the photography becomes of importance. On vertical mapping photography it has been the practice to employ a single lens camera using roll film and a lens of about 8¼ inch focal length. The altitude of the vertical photography is usually 10,000 feet above the ground or in rougher areas considerably higher, depending on the service ceiling limits of the aircraft, and careful attention is given to the mounting of the camera, the manner in which the aircraft is flown, and to other available aids that assist in maintaining during photography the vertical axis orientation of the camera. The employment of multi-lens cameras on vertical mapping photography offers possible economies and the performance of a recently constructed British camera of this type is now being investigated. In oblique mapping photography the use of three rigidly coupled cameras specially mounted in oblique position in a cabin aircraft and simultaneously exposed at definite intervals along the photographic flight, as introduced a short time ago, has resulted in substantial economies being effected.

Much of the air photography obtained primarily for mapping use has been found of great assistance in the consideration of various developments and investigations and has resulted in a remarkable increase in requests for such work. Requests of the various departments of the Dominion Government for air photography are referred to the Inter-departmental Committee on Air Surveys and Base Maps, which examines and co-ordinates them and prepares from them

an air photographic program within the capacity of the aircraft available for the purpose. Instructions for photographic operations approved by the committee are then drawn up by the Topographical and Air Survey Bureau and are submitted to the Royal Canadian Air Force, Department of National Defence. The instructions comprise operational maps compiled from available information on which the location of the projected photographic flights are shown, as well as the stations planned for control, and give the details of the equipment to be employed and the manner in which the photography is to be obtained. The Air Force carries out the air photography, transports the surveyor engaged on establishing astronomical stations for control use, develops and prints the negatives, and supplies the Topographical and Air Survey Bureau with a print of each negative obtained during the season for filing in the Air Photographic Library and such additional prints as are required for the original purpose outlined. Upon receipt of these photographs they are carefully indexed and filed so as to be immediately available for library examination. The details relating to the photography are also filed for ready reference. The additional copies required for mapping or other use are forwarded to the proper Department.

During the season 1935, instructions were issued and vertical air photography was obtained over all or part of the areas covered by the following map sheets of the National Topographic series:

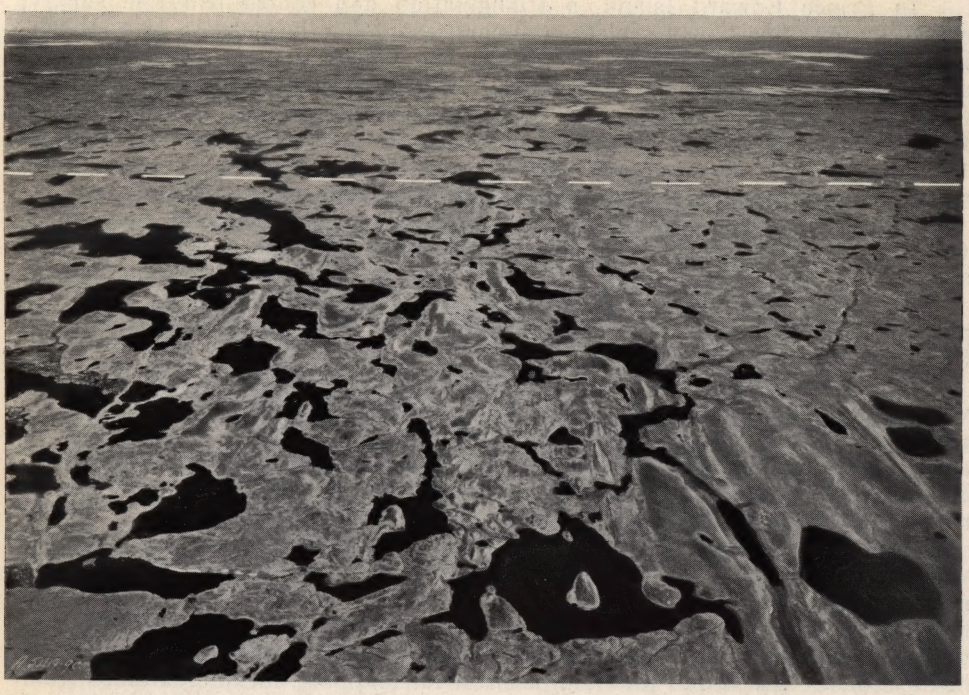
11-L/SW (P.E.I.); 11-D/15; 21-G/SE; 21-G/SW; 31-I/SW; 31-E/SE; 41-I/NE; 41-I/SE; 41-J/SW; 52-A/NE; 32-C/NW; 31-C/NE; 32-J/1; 32-J/2 32-J/3; and oblique air photography over all or part of: 32-F; 31-M; 42-F; 53-K (part); 53-L; 53-M; 74-F; 74-G; 74-C (part); 85-I; 75-D; 75-E; 75-F; 75-K; 75-L; Reindeer reserve comprising parts of 107 C, D, E, F, G. H. I. and J.

It is estimated that during the season the Air Force photographed about 14,000 square miles vertically and about 94,000 square miles obliquely. The number of photographs added to the library during the year was 54,238, making a grand total of 663,642 photographs.

During the year the plotting of oblique air photography covering the following four-mile sheets was completed:

Reindeer Lake North 64-E; Chibougamau 32-G; Long Lac 42-E; Stull Lake 53-K; Waswanipi 32-F; Knee Lake 53-M.

A rugged area in the vicinity of the South Nahanni and Flat rivers in the Northwest Territories, where placer gold mining activities had attracted attention, had been previously photographed obliquely and the courses of some of the streams had been covered by vertical photography. This photography was also plotted into a special map with approximate contours at 500-foot intervals. Other oblique photography plotted during the year covered the south shore of Great Bear lake, Northwest Territories, and the projected line of the Sixth meridian between Mackenzie river and lac La Martre, Northwest Territories. The Manitoba Government is now engaged in the reclamation of certain marshy areas adjacent to the Saskatchewan river. To assist them in their problems, the oblique photography covering a number of townships east of The Pas, Manitoba, was plotted and compiled into a special map of scale 2,000 feet to an inch.



This photograph is representative of the area to the east of Artillery lake, in the Northwest Territories, of which a four-mile-to-one-inch scale map is in course of preparation. It shows the large amount of detail within an area approximately two miles wide in the foreground and ten miles wide in the background (where indicated by white broken line), that has to be plotted in compiling a map of the region, for which about 1,000 similar photographs are required.

During the year the following four-mile sheets compiled from oblique photography were issued: Stony Rapids, Fond du Lac, Tazin Lake; and also a two-mile map sheet similarly compiled, namely, Blacksmith Rapids.

Compilation of the following four-mile map sheet areas which have been photographed obliquely has been commenced: Timiskaming, Oxford House, Clearwater, Cree Lake, Frobisher Lake, Fort Smith, Taltson Lake, Nonacho Lake, Fort Reliance, Christie Bay, Hearne, Yellowknife.

The plotting of vertical air photography covering the following map sheet areas or parts thereof was completed during the year:

Port Arthur-Fort William, Kaministikwia, Long Lac (part), Renfrew, Sunnybrae (one-half), Grand Mere, Choquette.

The Air Photographic Library is maintained in the office of the Topographical and Air Survey Bureau, and a great many requests for information relating to available photography over different areas in Canada are received, not only from the various departments of the Government, but also from the public in general. Throughout the year this involves considerable correspondence, the preparation and supply of additional index maps, and other clerical and examination work.

Special Surveys

Control Surveys.—During the year control for mapping operations was provided mainly by traverses and astronomical observations for latitude and longitude.

In Prince Edward Island, a triangulation and control traverse survey, extending over five bays or inlets, was carried out for the purpose of establishing control survey monuments to govern the laying out of oyster leases by officers of the Department of Fisheries. Seventy permanent monuments were established, the positions of which have been computed and supplied to the Department of Fisheries. The work necessitated the measurement of angles at 103 triangulation stations, and the running of 44 accurate traverses. For mapping purposes a stadia traverse was made of 360 miles of shoreline.

In Nova Scotia, the plane-table mapping of the Amherst map sheet (21-H-16) necessitated the running of 230 miles of accurate chain traverse, and 35 miles of stadia traverse during the year, to supplement existing control.

In Ontario, traverse surveys were run to provide ground control for mapping the Bobcaygeon and Haliburton map sheets (31-D/N.E. and 31-E/S.E.) from vertical aerial photographs.

In accordance with the usual practice of the survey, permanent monuments were established at suitable intervals along this traverse, the geographical positions of which are now available for future use. A total of 218 miles of actual chain traverse was run and 62 permanent monuments were established. Spirit levels were carried along the survey lines, and the elevation of the 62 monuments determined according to the North American datum.

Astronomical Work.—Astronomical observations for latitude and longitude were taken at thirty-one points in the Northwest Territories, four points in northern Saskatchewan, four points in northern Manitoba, and three points in northern Ontario—a total of forty-two points. Fifty-two separate observations for latitude and longitude were taken. These observations are made mainly for the purpose of providing control for mapping unexplored areas from oblique aerial photographs. The scheme of observations is carefully planned so that each observation point lies on a control flight, and a local survey must be made at each point so as to enable its position to be accurately located in the foreground of an oblique aerial photograph, and to provide a check on the orientation and scale of the photographic strip map. Transport to and from the observation points is provided by aeroplane.

One interesting feature of the year's program was the fact that the majority of the observations were taken in high latitudes, seven of the observation points being well within the Arctic Circle. During June and July in these high latitudes there is no darkness, and the observations must be made in daylight. But while consideration was given to this feature in the selection of the observational equipment, it was not always possible to make satisfactory stellar observations with the instruments available, and at three points it was necessary to rely upon sun observations with a definite but unavoidable loss of precision.

The method of observation employed when observing on stars was to note the time of transit of each star across a fixed altitude circle. The instrumental equipment provided for two of the observers was specially designed for this type of observation. It consisted of a British Admiralty Pattern prismatic astrolabe with chronometer, chronograph, and radio set.

The principle of the instrument is to observe the time instant at which two images of a star are in coincidence, one image being formed by the outer annular ring of the telescope objective after reflection from the surface of a mercury bath, and the other image being formed by the inner portion of the telescope objective after reflection from the two interior surfaces of a pentagonal prism. When coincidence of these two images occurs the star is at a certain fixed altitude, depending upon the angles of the pentagonal prism. In the astrolabes used, this fixed altitude is approximately 45°; its precise value does not enter into the computations.

The computations are abbreviated as much as possible by using an approximate graphical solution to obtain the final value of the latitude and longitude.

A precise least square adjustment is made for a few specimen observations, in order to form some idea of the relative precision of the various graphical solutions obtained.

Another point of interest in this work was the use of a radio transmitting set, specially designed by the Signals Corps, Department of National Defence. The purpose of this set was to enable the observer to signal to one of the neighbouring signal stations as soon as he had completed a satisfactory astronomical observation, so that one of the photographic aeroplanes could be sent for him without loss of time. Radio signals were sent and received satisfactorily up to a distance of 300 miles.

Magnetic Work.—As in the past, our surveyors in the field took observations for magnetic declination in the ordinary course of their work. Such observations do not delay their regular field work, and provide valuable information as to the magnetic declination and its variation in different parts of Canada. Many such observations were taken by provincial and private surveyors who are interested in this subject, and forwarded to this office for reduction and co-ordination with other observations. Wherever possible it is our practice to standardize the surveyors' instruments by comparison with an instrument recently standardized at the Dominion Observatory. Whenever convenient, observations are taken at certain selected meridian or repeat stations previously established across the country, so that valuable information is obtained as to the march or annual variation of the compass.

Computations.—Besides the various computations necessary in reducing the field astronomical observations, and in computing and adjusting the field traverses, considerable mathematical and computational work was necessary in the solution of problems arising in the ordinary course of the survey and map work of the Bureau. These included the preparation of field observing lists for the type of star observations described above; the preparation and publishing of the usual astronomical field tables for azimuth observations on the Pole star and on the sun; the study and design of map projections suitable for different types of maps, and general miscellaneous work.

Electoral Maps.—The holding of the General Election in October, 1935, necessitated the preparation and distribution, under the direction of the Chief Electoral Officer, of a large number of electoral maps. During the year some thirty thousand electoral maps were distributed.

Legal Surveys

In the Great Bear Lake region three new claims were surveyed during the year, and in the lead-zinc area south of Pine Point on Great Slave lake 124 new claims were surveyed, including twenty-two claims staked under the old two-post regulations, and kept in good standing since 1929. Mineral claim surveys of the previous year in the Great Bear Lake area to the number of 165 were examined for approval. As about 25 per cent of these exceeded 60 acres in area, it was necessary to take the proper steps toward cutting them down and disposing of the excess area under section 76 of the Quartz Mining Regulations. There are numerous delays that may occur in this procedure, but final action has been taken on thirty-five of them and others are still pending.

A new Manual respecting the survey of Quartz Mining Claims on Dominion Lands was issued during the year. Three years' operation under the four-post regulations developed a number of amendments and new interpretations to the Quartz Mining Regulations affecting the method of survey of claims, and a restatement of the general instructions of the Surveyor General became necessary to clarify the situation. The Manual was enlarged also to include the survey of claims located by the two-post location line still in force in the Yukon Territory and in force in the Northwest Territories prior to 1929.

The boundaries of Banff National Park follow largely the crest of mountain ridges, but these natural boundaries are interrupted in places to cross the valleys of streams flowing out of the park area. There are trails leading into the park in all these valleys, and in order to enforce the observance of Park Regulations it is necessary to mark out the boundary where it crosses these valleys in straight lines, so that hunters and others travelling on these trails or in these valleys may know when they are about to enter the park.

A survey party was engaged upon the survey and delimitation of these straight-line boundaries. The method of survey was first to ascertain the position in the valley of the straight line joining its terminal points high up in the mountains and then to erect a prominent stone cairn and park standard close to the trail through the valley. From this a prominent line was cut through the woods as far as practicable up the sides of the valley and another cairn and park standard was erected at this point on each side. The park standard consisted of an angle-iron bar seven feet long with a heavy metal plate attached at the top bearing the name "Banff Park Boundary" facing out of the park. The rock cairn five or more feet in height was built around this standard, making a very durable and conspicuous sign post. The boundary was marked at Spray river, Devil's Gap, Barrier, Panther, Red Deer and Clearwater rivers, Siffleur creek, Saskatchewan river, and at Nigel and Sunwapta passes. The preparation of the surveyor's returns was supervised, and plans and field notes were checked as they were completed.

A portion of the western boundary of Glacier National Park, where it crosses the valley of Illecillewaet river and the right of way of the Canadian Pacific Railway in a straight line from peak to peak, was also similarly established. This survey will enable the department to complete the grants to the railway company of its right of way in Glacier Park.

Several matters regarding the delimitation of interprovincial boundaries have been dealt with. Alberta is desirous of completing the survey of her eastern boundary, which is the Fourth meridian in the system of survey of Dominion lands, and of marking the boundary between Alberta and the Northwest Territories from Fort Smith eastward to the Fourth meridian. Saskatchewan and Manitoba have been negotiating for the appointment of a three-member commission, including the Surveyor General of Dominion Lands, to complete the survey of their common boundary, and Manitoba and Ontario have been seeking the co-operation of the Dominion in extending the survey of their common boundary from Island lake toward Hudson bay.

At the request of the National Parks of Canada the detailed specifications for a proposed extension to Wasagaming summer resort in Riding Mountain National Park were worked out and instructions issued to the resident engineer, who is a commissioned Dominion Land Surveyor, to complete the survey of twenty-eight additional blocks of lots, and eight reserved areas not yet subdivided. This extension will make 510 more lots available in this resort.

Five historic sites to commemorate events of national interest were surveyed, one being located in Prince Edward Island, one in Nova Scotia, and three in Ontario.

Continuing the work undertaken for the Penitentiaries Branch of the Department of Justice, a Quebec Land Surveyor undertook the survey of the penitentiary reserve at St. Vincent de Paul. A very large number of parcels of land were acquired for this reserve, and owing to imperfect descriptions in some of the very old documents relating thereto, a few matters were discovered that needed adjustment before the definition of a few portions of the boundaries could be completed. When everything has been put in order it will be necessary for the surveyor to return to the field to finish his survey before a complete plan can be prepared.

A considerable number of technical land descriptions required by the department for insertion in Orders in Council, leases, etc., were examined and amended where necessary.

Numerous inquiries from officials of the western provinces and from owners of lands therein relating to surveys made by the Dominion were received, and the required information was furnished as in the past.

Survey Records and Distribution Division

Survey Records.—This Division has charge of the registration and recording of all the various survey notes and plans affecting Dominion lands, interprovincial boundaries, etc., and all survey returns for the topographical and aerial surveys carried on in connection with the issuing of topographical maps in all parts of Canada. Up to the end of the present fiscal year, over twenty-one thousand books and over thirty-nine thousand plans had been placed on record.

Having charge of the survey records also involves, of course, the dealing with technical correspondence relating to inquiries for information about the survey notes and plans, and requests for official plans. Answering these requests not only involves the searching of the surveyors' field notes and files but, in many cases, the supplying of copies of notes and plans. When required for the law courts, the copies of the notes and plans are officially certified. The number of copies of official plans of townships, townsites, and settlements distributed during the year was 3,067.

Distribution of Maps and Publications.—This Division now distributes not only all the publications and topographical and geographical maps issued by this Survey Bureau, but all the topographical maps issued by the Geographical Section, Department of National Defence. There are now available for distribution from this office about 100 reports and pamphlets and about 1,000 different maps. A price has been set on all of these maps and official plans and on all of the reports and pamphlets, except certain technical publications intended only for technical officials of the government, surveyors, engineers, and scientific organizations. During the past twelve months there were distributed 100,883 maps and 3,870 publications.

The demand for maps is continually increasing, the number distributed during the past year being more than 10,000 greater than the previous year which up to that time had been a record. The requests come from mining companies and prospectors; lumber and pulp and paper companies; engineering firms and surveyors; tourists and travellers; railway and transportation companies; flying companies and aviators; commercial firms of all kinds; departments of the Federal and provincial governments; universities, schools, and libraries.

An increasing number of requests are coming from residents of other countries, especially the United States, who wish to spend their vacation in Canada, hunting, fishing, taking canoe trips, etc. The ordinary tourist road maps are sufficient in some cases where tourists wish only to travel on the main highways, but for those who wish to hunt or fish, to take canoe trips or to explore the less settled areas, a detailed map is a necessity. In fact unless such a map is available many will not come to the country at all. This is shown by the greatly increased demand from tourists since the new detailed maps have been issued for such areas as the Quetico, Muskoka, and Algonquin Park districts and the region north of Ottawa.

Of the maps issued during the past year, the greatest single demand was for the new edition of the Map of Canada on a scale of 100 miles to an inch. This map, which sells for 25 cents, is approximately 25 inches by 35 inches and is a very convenient size for those who do not require a large wall map. Ten thousand copies of this map were printed in September; less than five months

later this stock was entirely exhausted and it was necessary to print another ten thousand copies.

Another map which was issued and which will fill a long-felt want is the new Nova Scotia sheet, No. North L-20, of the International Map of the World. This map is on a scale of 1:1,000,000 or 15·78 miles to an inch and covers all of Nova Scotia and Prince Edward Island and the easterly portion of New Brunswick.

Two maps of a popular character are in course of preparation and will be issued early in the coming fiscal year. They are the Fort Coulonge and Ste. Agathe sheets of the National Topographic series, on a scale of 2 miles to an inch. They will cover part of that area in Quebec which is north of the lower Ottawa river. The Fort Coulonge sheet will be issued the latter part of May, 1936, and the Ste. Agathe sheet about two months later.

Board of Examiners for Dominion Land Surveyors

The Board of Examiners for Dominion Land Surveyors held two meetings during the year. The first was a special meeting held on two days: Monday, May 20, 1935, and Thursday, June 6, 1935. During this meeting examinations were held at Edmonton, Alberta. The second was the regular annual meeting called for by section 9 of the Dominion Lands Surveys Act. It began on Monday, February 10, 1936, and lasted until Thursday, March 12, 1936. During this meeting, examinations were held at Ottawa, Kingston, Winnipeg, and Halifax.

The total number of candidates who presented themselves at the examinations was thirty-seven; and they were all candidates at the Preliminary examination. Of this number, twelve candidates were successful, as follows:—

S. Antenbring,	S. H. DeJong,	E. R. Hyman,
O. H. Bjarnason,	D. C. M. Duncan,	D. W. Miller,
K. W. Campbell,	H. G. Griffiths,	D. S. Ross,
C. F. Cautley,	G. H. Hall,	R. Thistlethwaite.

Three Dominion Standard measures of length were issued during the year, and one was tested and reissued.

Map Publication

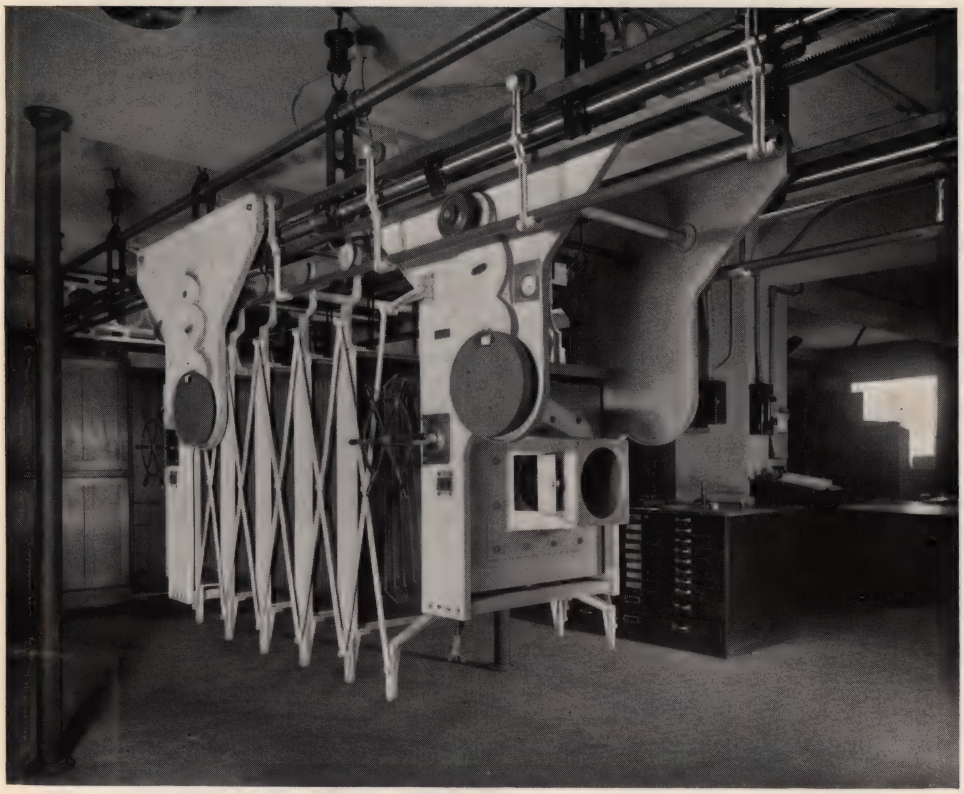
The maps published during the year and those in course of preparation are shown in a separate list under this section of the report.

Some of the maps printed for other organizations ran into much larger editions than those of the Bureau. In all, approximately 27,425 copies of Bureau maps and 160,225 copies for other government agencies were printed in the lithographic division, totalling approximately 784,000 impressions.

During the year two of the former Chief Geographer's standard geographic maps were reprinted without revision. Several others of this series are out of print or nearly so and will also be reprinted without revision where no other later maps of the National Topographic series are available.

The new camera in the photo-mechanical division, the completion of which was recorded in last year's report, has been in operation during the year with excellent results.

The detailed statement of the work performed in the photo-mechanical division includes: wet plate negatives, 2,379; photo-lithographic plates, 284; vandyke prints, 7,790 square feet; vandyke prints (contact), 2,507; blue prints and blue line prints, 221,176 square feet; blue prints on linen, 526 square feet; photostat, 5,774 sheets; enlargements and contact prints, 1,969; grids, 723; line and half-tone cuts, 108; intaglio plates, 8.



The latest contribution to the art of map-making. This huge three-ton steel and aluminium camera was designed and built by the Topographical and Air Survey Bureau to meet the exacting requirements of map reproduction.

LIST OF MAP SHEETS OF THE NATIONAL TOPOGRAPHIC SERIES AND OF THE SECTIONAL SERIES ISSUED 1935-36, AND IN HAND ON MARCH 31, 1936

Issued 1935-36

Prov.	No.	Series	Name	Scale (in miles to 1 inch)	Latitude	Longitude	Remarks
N.B.	21-I/SW	N.T.	Chipman	2	46° 00′ to 46° 30′	65° 00′ to 66° 00′	*(b)*
	N½21-SE						
	S½21-NE	N.T.	Fredericton-Moncton	8	45° 00′ to 47° 00′	64° 00′ to 68° 00′	*(a)*
Que.	31-G/NW	N.T.	Buckingham	2	45° 30′ to 46° 00′	75° 00′ to 76° 00′	*(b)* reprint
Ont.	42-I/NW	N.T.	Blacksmith Rapids	2	50° 00′ to 50° 30′	81° 00′ to 82° 00′	*(b)*
	52-C	N.T.	Rainy Lake	4	48° 00′ to 49° 00′	92° 00′ to 94° 00[1]	*(b)* reprint
	52-E	N.T.	Kenora	4	49° 00′ to 50° 00′	94° 00′ to 96° 00′	*(b)* reprint
	52-F	N.T.	Dryden	4	49° 00′ to 50° 00′	92° 00′ to 94° 00′	*(b)* reprint
Man.	53-L	N.T.	Oxford House	4	54° 00′ to 55° 00′	94° 00′ to 96° 00′	*(b)* reprint
	63-J	N.T.	Wekusko Lake	4	54° 00′ to 55° 00′	98° 00′ to 100° 00′	*(b)* reprint
Sask.	63-M	N.T.	Pelican Narrows	4	55° 00′ to 56° 00′	102° 00′ to 104° 00′	*(b)* reprint
	74-N	N.T.	Tazin Lake	4	59° 00′ to 60° 00′	108° 00′ to 110° 00′	*(b)*
	74-O	N.T.	Fond-du-Lac	4	59° 00′ to 60° 00′	106° 00′ to 108° 00′	*(b)*
	74-P	N.T.	Stony Rapids	4	59° 00′ to 60° 00′	104° 00′ to 106° 00′	*(b)*
	268	Sect.	Carlton	3	52° 29′ to 53° 12′	106° 00′ to 108° 03′	*(e)*

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P.E.I.	S½11/NW						
	N½11/SW	N.T.	Charlottetown-Sydney	8	45° 00′ to 47° 00′	60° 00′ to 64° 00′	*(b)*
N.S.	21-H/16	N.T.	Amherst	1	45° 45′ to 46° 00′	64° 00′ to 64° 30′	*(a)*
	11-E/SE	N.T.	Sunnybrae	2	45° 00′ to 45° 30′	62° 00′ to 63° 00′	*(b)*
	21-A/SE	N.T.	Bridgewater	2	44° 00′ to 44° 30′	64° 00′ to 65° 00′	*(b)*
	21-I/NW	N.T.	Newcastle	2	46° 30′ to 47° 00′	65° 00′ to 66° 00′	*(b)*
Que.	31-F/NE	N.T.	Fort Coulonge	2	45° 30′ to 46° 00′	76° 00′ to 77° 00′	*(a)*
	31-I/NE	N.T.	Grand Mere	2	46° 30′ to 47° 00′	72° 00′ to 73° 00′	*(b)*
	31-J/SE	N.T.	Ste. Agathe	2	46° 00′ to 46° 30′	74° 00′ to 75° 00′	*(b)*
	31-N/NE	N.T.	Vimy	2	47° 30′ to 48° 00′	76° 00′ to 77° 00′	*(b)*
	31-O/NW	N.T.	Choquette	2	47° 30′ to 48° 00′	75° 00′ to 76° 00′	*(b)*
	32-B/SW	N.T.	Oskelaneo	2	48° 00′ to 48° 30′	75° 00′ to 76° 00′	*(b)*
	32-C/SE	N.T.	Doucet	2	48° 00′ to 48° 30′	76° 00′ to 77° 00′	*(b)*
	32-B	N.T.	Gouin Reservoir	4	48° 00′ to 49° 00′	74° 00′ to 76° 00′	*(b)*
	32-F	N.T.	Waswanipi	4	49° 00′ to 50° 00′	76° 00′ to 78° 00′	*(b)*
	32-G	N.T.	Chibougamau	4	49° 00′ to 50° 00′	74° 00′ to 76° 00′	*(b)*
	21-NW	N.T.	Quebec-Edmundston	8	46° 00′ to 48° 00′	68° 00′ to 72° 00′	*(a)*
	31-NW	N.T.	Upper Ottawa River	8	46° 00′ to 48° 00′	76° 00′ to 80° 00′	*(b)*
Ont.	31-F/7	N.T.	Renfrew	1	45° 15′ to 45° 30′	76° 30′ to 77° 00′	*(a)*
	52-A/SW	N.T.	Fort William-Port Arthur	2	48° 00′ to 48° 30′	89° 00′ to 90° 00′	*(b)*
	52-A/NW	N.T.,	Kaministikwia	2	48° 30′ to 49° 00′	89° 00′ to 90° 00′	*(b)*
	42-E	N.T.	Long Lac	4	49° 00′ to 50° 00′	86° 00′ to 88° 00′	*(b)*
	52-H	N.T.	Nipigon	4	49° 00′ to 50° 00′	88° 00′ to 90° 00′	*(b)*
	31-SW	N.T.	Toronto-Ottawa	8	44° 00′ to 46° 00′	76° 00′ to 80° 00′	*(b)*
	52-NE	N.T.	Sioux Lookout-Armstrong	8	50° 00′ to 52° 00′	88° 00′ to 92° 00′	*(b)*
	52-SW	N.T.	Kenora-Fort Frances	8	48° 00′ to 50° 00′	92° 00′ to 96° 00′	*(b)*
Man.	53-K	N.T.	Stull Lake	4	54° 00′ to 55° 00′	92° 00′ to 94° 00′	*(b)*
	53-M	N.T.	Knee Lake	4	55° 00′ to 56° 00′	94° 00′ to 96° 00′	*(b)*
Sask.	64-E	N.T.	Reindeer Lake North	4	57° 00′ to 58° 00′	102° 00′ to 104° 00′	*(b)*
	74-F	N.T.	Clearwater	4	57° 00′ to 58° 00′	108° 00′ to 110° 00′	*(b)*
B.C.	92-G/1	N.T.	Sumas	1	49° 00′ to 49° 15′	122° 00′ to 122° 30′	*(a)*
	92-G/2	N.T.	New Westminster	1	49° 00′ to 49° 15′	122° 30′ to 123° 00′	*(a)*
	92-G/3	N.T.	Vancouver South	1	49° 00′ to 49° 15′	123° 00′ to 123° 30′	*(a)*
	92-G/6	N.T.	Vancouver North	1	49° 15′ to 49° 30′	123° 00′ to 123° 30′	*(a)*
	92-L/1	N.T.	Schoen Lake	1	50° 00′ to 50° 15′	126° 00′ to 126° 30′	*(a)*
	92-L/2	N.T.	Woss Lake	1	50° 00′ to 50° 15′	126° 30′ to 127° 00′	*(a)*
	92-L/6	N.T.	Alice Lake	1	50° 15′ to 50° 30′	127° 00′ to 127° 30′	*(a)*

LIST OF MAP SHEETS OF THE NATIONAL TOPOGRAPHIC SERIES AND OF THE SECTIONAL SERIES ISSUED 1935-36, AND IN HAND ON MARCH 31, 1936—*Concluded*

IN HAND, MARCH 31, 1936—*Concluded*

Prov.	No.	Series	Name	Scale (in miles to 1 inch)	Latitude	Longitude	Remarks
B.C.....							
	92-L/7	N.T..	Nimpkish.....	1	50° 15′ to 50° 30′	126° 30′ to 127° 00′	*(a)*
	92-L/8	N.T..	Adam River.....	1	50° 15′ to 50° 30′	126° 00′ to 126° 30′	*(a)*
	92-L/10	N.T..	Alert Bay.....	1	50° 30′ to 50° 45′	126° 30′ to 127° 00′	*(a)*
	93-A/11	N.T..	Spanish Lake.....	1	52° 30′ to 52° 45′	121° 00′ to 121° 30′	
	93-A/12	N.T..	Hydraulic.....	1	52° 30′ to 52° 45′	121° 30′ to 122° 00′	*(a)*
	93-A/13	N.T..	Swift River.....	1	52° 45′ to 53° 00′	121° 30′ to 122° 00′	
	93-A/14	N.T..	Cariboo Lake.....	1	52° 45′ to 53° 00′	121° 00′ to 121° 30′	
	92-B/NW	N.T..	Victoria.....	2	48° 30′ to 49° 00′	123° 00′ to 124° 00′	*(a)*
	93-K/SE	N.T..	Fraser Lake.....	2	54° 00′ to 54° 30′	124° 00′ to 125° 00′	*(b)*
N.W.T..	85-I	N.T..	Hearne.....	4	62° 00′ to 63° 00′	112° 00′ to 114° 00′	*(b)*

NOTES.—Work performed on those sheets marked "In Hand" ranges throughout the various stages from the commencement of the compilation in the office to the preparation of the final lithographic plates for printing. Some sheets upon which very little work has so far been done are not included in the above list.

Where a map sheet extends into more than one province, it is listed under one province only.

Under the column of "Remarks" the following are the meanings attached to the symbols used:—

(a) National Topographic Series—Standard Edition—Topographical information complete.

(b) National Topographic Series—Provisional Edition—Topographical information complete or nearly so (except for contours), over all or greater portion of sheet.

(c) National Topographic Series—Exploratory Edition—Topographical information from exploration surveys, or where control is inadequate, no contours or contours conjectural only.

(d) Sectional Map Series—New Series Edition—Detailed topographical information in eight colours, including contours.

(e) Sectional Map Series—Intermediate Series Edition—Topographical information in five colours not so complete, contours, when shown, usually approximate only.

(f) Sectional Map Series—Old Series Edition—Generally topography only, in from one to four colours.

LIST OF MISCELLANEOUS MAP SHEETS AND PLANS ISSUED 1935-36 AND IN HAND MARCH 31, 1936

Issued 1935-36

Province	Map	Scale (in miles to 1 inch)	Remarks
P.E.I.	Plan of Malpeque Bay showing areas for oyster leases	1,000′= 1 inch	
N.S.	Nova Scotia, N-12-M	1 to 1,000,000	International map of the world.
N.B.	Map of New Brunswick	10	
Que.	Chibougamau (4 quarters)	2	Advance information.
	Ste. Agathe, N.E. and S.E. ¼	1	Advance information; reprint
Ont.	Nipigon (4 quarters)	2	Advance information
	Ottawa Geographic series	3·95	Reprint without revision.
	Toronto Geographic series	3·95	Reprint without revision.
	Perth-Kingston	2	Reprint.
Sask.	Saskatchewan South	16	
	Plan of Waskesiu	.....	
Misc.	60 township plans	½	39 were reprints.
	Index to National Topographic series—Ontario	.....	
	Index to National Topographic series—Quebec	.....	
	Index to National Topographic series for Annual Report	.....	
	Index to sectional sheets	.....	
	Dominion of Canada	100	Two printings.
	Territorial Evolution of Canada	.....	For Bureau of Statistics.
	Chart showing Greater Cities in Canada	.....	For Bureau of Statistics.
	Map showing Vancouver constituencies	.....	For Chief Electoral Officer.
	Map showing main automobile roads of Canada and United States	.....	For Canadian Travel Bureau.
	Automobile road map (Eastern sheet)	.....	For Canadian Travel Bureau (2 printings).
	Automobile road map (Central sheet)	.....	For Canadian Travel Bureau.
	Automobile road map (Western sheet)	.....	For Canadian Travel Bureau.
	Chart of Harbours in Barkley Sound	.....	For the Hydrographic Survey.
	Chart of Harbours in Juan de Fuca Strait	.....	For the Hydrographic Survey.
	Chart of Anchorages in Magdalen Islands	.....	For the Hydrographic Survey.
	Map of Canada showing radio stations	100	For Radio Branch, Department of Marine.
	Map of three prairie provinces	.....	For Department of Agriculture.
	Map of Southern Saskatchewan showing municipalities	.....	For province of Saskatchewan.
	Map of New Brunswick	10	For province of New Brunswick.
	Edmonton Land Agency	12½	For province of Alberta.
	Southern Alberta	35	For province of Alberta.

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Que.	Chicoutimi	2	
Ont.	Guelph Geographic series	3·95	Reprint without revision.
Man.	Manitoba North	16	
	Manitoba South	16	
Sask.	Saskatchewan North	16	
Alta.	Alberta South	16	
	Jasper Park South	3	
Yukon	Yukon Territory	10	
N.W.T.	Cameron Bay	1	
General	Index to National Topographic series—Manitoba and Saskatchewan	40	
	Resources Map of the Dominion	100	
	Automobile road map (Western sheet)	40	For Canadian Travel Bureau.
	Kent County Soil Map	.....	For Department of Agriculture.

APPENDIX I

Schedule of Surveyors Employed and Work Executed by Them

Carroll, John—

Astronomical observations for latitude and longitude for controlling the mapping by air photographs of the following map sheets of the National Topographic series: 42 C, 42 D, 42 F, 74 F, 74 G, 75 C, 75 D, 75 E, 75 F, 75 G, 75 J, 75 L, 75 M, 85 A, 85 I, 85 J, 86 C, 86 G. (Some of these observations were to supplement control obtained in previous years);

Forty-five observations for magnetic declination.

Chartrand, D. E.—

Survey of the historic site commemorating the Lansdowne Iron Furnace at Lyndhurst, Ontario, for the National Parks of Canada; survey of intermediate aerodrome sites at Kapuskasing, Kenora, Killaloe, Pendleton, and Nakina; survey of an extension to the intermediate aerodrome site at Kowkash; survey of radio beacon sites at Kapuskasing, Nakina, and Sioux Lookout; all for the Department of National Defence; preliminary survey of both sides of Rideau river from Hogs Back to Black Rapids, in connection with a project to provide a greater reservoir for the utilization of water power at Rideau Falls, which water power is used by the National Research Council of Canada; 9 magnetic observations.

Fletcher, W. A., with R. R. Ross and G. A. Surette as assistants—

Horizontal and vertical control and topographic mapping of Amherst map sheet No. 21-H/16 of the National Topographic series, latitudes 45° 45′ to 46° 00′ and longitudes 64° 00′ to 64° 30′; surveys for producing plans for the use of the Department of Fisheries in connection with the administration of oyster leases at Foxley river, Mustico bay, Covehead bay, Brackley bay, Tracadia bay, and Savage harbour, all in Prince Edward Island; 45 magnetic observations.

Fry, E. S.—

Astronomical observations for latitude and longitude for controlling the mapping by air photographs of the following map sheets of the National Topographic series: 53 F, 53 K, 53 M, 85 O, 86 B, 86 D, 86 E, 86 F, 86 G, (some of these observations were to supplement control obtained in previous years);

Eight magnetic observations.

Harris, L. E.—

The photo-topographical survey of a part of Jasper park surrounding Maligne lake and extending southeasterly to connect with previous mapping surveys.

Lambart, H. F.—

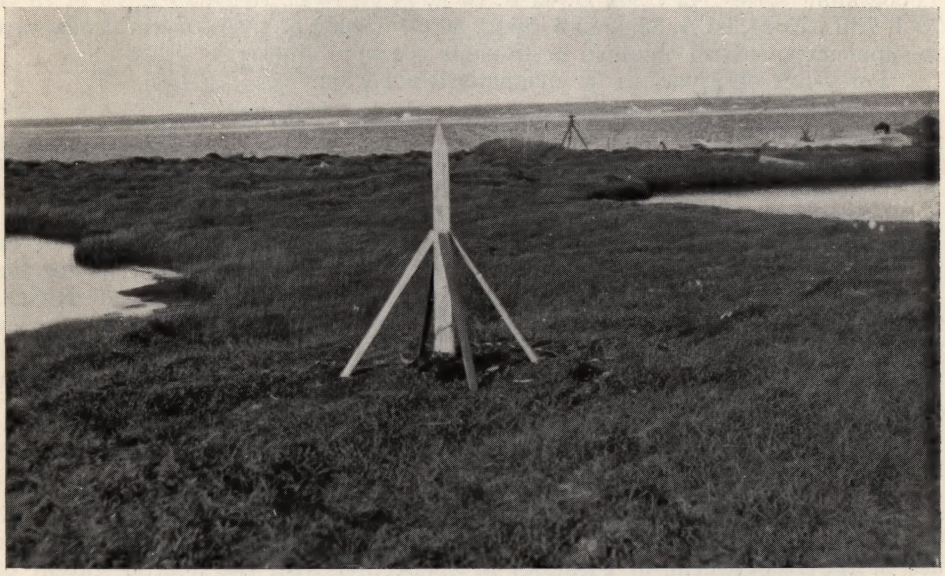
The survey of the boundary of Banff park across Spray river, Dormer river, Panther river, Red Deer river, Clearwater river, Siffleur river, and Saskatchewan river and across Devils Gap pass, Sunwapta pass, and Nigel pass.

PALMER, P. E.—

Interpretation of topographical details on vertical air photographs and obtaining information for the approximate contouring of two map sheets of the National Topographic series: Ste. Agathe, latitures 46° 00′ to 46° 30′, longitudes 74° 00′ to 75° 00′ and Maniwaki, latitudes 46° 00′ to 46° 30′ and longitudes 75° 00′ to 76° 00′.

PERRY, A. M.—

Astronomical observations for latitude and longitude for mapping control of the Reindeer reserve near Aklavik in the Northwest Territories; several short traverses to check the scale of the air photographs; 29 magnetic observations at new points, and 61 observations at Aklavik magnetic repeat station.



Monument marking the site of astronomical observation for latitude and longitude made near Cape Dalhousie, on the Arctic coast. This is the most northerly Canadian survey monument on the mainland, and it was placed while surveying a grazing area for Canada's recently established reindeer herd.

SEGRE, B. H., and G. ST. JOHN BAYLY as assistant—

Horizontal and vertical control for map sheets 31-D/N.E. and 31-E/S.E.; interpretation of topographical details from vertical air photographs for the same map sheets; 54 magnetic observations.

TAGGART, C. H., with S. HUNT as assistant—

Horizontal and vertical control and topographical survey of part of Sumas map sheet 92-G/1, and part control for the Chilliwack map sheet 92-H/4; completion of topographical mapping of Vancouver North map sheet 92-G/6; interpretation of topographical details on vertical air photographs and revision of existing maps for the Victoria map sheet 92-B/N.W. and S.W., survey of part of the west boundary of Glacier park where it crosses the Illecillewaet River valley and the Canadian Pacific Railway right-of-way in township 26, range 27, west of the Fifth meridian; 55 magnetic observationns.

Reqn. 7342